

VU Research Portal

Does distance matter? An ego-network approach towards the knowledge-based theory of clusters

Bahlmann, M.D.; Elfring, T.; Groenewegen, P.; Huysman, M.H.

2010

document version

Early version, also known as pre-print

[Link to publication in VU Research Portal](#)

citation for published version (APA)

Bahlmann, M. D., Elfring, T., Groenewegen, P., & Huysman, M. H. (2010). *Does distance matter? An ego-network approach towards the knowledge-based theory of clusters*. (Research Memorandum; No. 2010-4). Faculteit der Economische Wetenschappen en Bedrijfskunde.

General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal ?

Take down policy

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

E-mail address:

vuresearchportal.ub@vu.nl

**Does distance matter? An ego-network approach
towards the knowledge-based theory of clusters**

Research Memorandum 2010-4

**Marc D. Bahlmann
Tom Elfring
Peter Groenewegen
Marleen H. Huysman**

DOES DISTANCE MATTER? AN EGO-NETWORK APPROACH TOWARDS THE KNOWLEDGE-BASED THEORY OF CLUSTERS

Marc D. Bahlmann¹

Tom Elfring

Peter Groenewegen

Marleen H. Huysman

VU University Amsterdam

The Netherlands

Abstract

The purpose of this article is to empirically analyze how different forms of proximity influence interactive learning and ease of knowledge transfer among entrepreneurs, in order to advance the knowledge-based theory of clusters. Making use of ego-network data, gathered among entrepreneurs from the Amsterdam IT and new media-cluster and analyzed using structural equation modeling, the data lead us to reconsidering the role of geographical proximity as main catalyst of interactive learning and knowledge flow among entrepreneurs. A strong case is put forward for acknowledging other forms of proximity, namely relational, cognitive, and in particular epistemic proximity, as main facilitators of interactive learning and ease of knowledge transfer.

Key words: clusters, interactive learning, entrepreneurship, (epistemic) proximity

¹ Correspondence: M.D. Bahlmann, De Boelelaan 1105, 1081 HV Amsterdam, Room 3A-17, Telephone: +31(0)20 59 83 660, e-mail: mbahlmann@feweb.vu.nl

1. INTRODUCTION

A central theme in cluster literature revolves around the question to what degree clusters, here defined as agglomerations of similar and related business activities, enhance entrepreneurs' creative and innovative capabilities through facilitating local learning (Bahlmann and Huysman 2008). Put differently, being located in a local knowledge network is considered to intensify one's creativity, learning, and innovative capacities. The spatial clustering of economic activities is supposed to enhance not only local learning (Bathelt, Malmberg and Maskell 2004), but also regional economic revitalization and intensified innovation (Amin and Roberts 2008). Clusters are, thus, seen as the prime vehicles for supporting knowledge dynamics among entrepreneurs, for spatial agglomeration eases the process of knowledge transfer and learning through forming relationship-specific heuristics.

These processes of learning and knowledge transfer are assumed to be spatially sticky due to their context specific nature. This implies that actors can only share new, creative ideas effectively when sharing a similar social context which is, to a large extent, assumed to be defined locally (Sole and Edmondson 2002; Gertler 2003, Lam 1997). As such, it is considered advantageous for entrepreneurs to be located in a cluster, surrounded by similar and related entrepreneurs with whom they can interact (Bathelt *et al.* 2004).² In principle, the process of local learning taking place within a cluster is considered to be facilitated by high degrees of geographical proximity (i.e. being located in the same cluster) and cognitive proximity (i.e. the degree to which ego and alter share similar work related knowledge) among the actors involved.

The above line of reasoning, however, is increasingly met with a sense of unease, as recent studies argue that it is not the local knowledge network per se distinguishing successful clusters from unsuccessful ones. Clusters, it is argued, can distinguish themselves through building and maintaining so-called pipelines: "a variety of channels for low-cost exchange of knowledge with relevant hotspots around the globe" (Bathelt *et al.* 2004: 33; see also Saxenian 2006; Owen-Smith and Powell 2004; Tallman and Phene 2007). New creative input is considered to enter the cluster through entrepreneurs with ties to other 'knowledge hotspots' (i.e. clusters), enhancing the creativity of the entrepreneur involved as well as the

² In addition, the co-location of similar and related entrepreneurs is said to increase competition and rivalry, thus serving as a strong incentive for both innovation and product- or service-differentiation (Porter 1990; 1998). Being located in a cluster enhances an entrepreneur's ability to constantly monitor and compare his/her offerings to that of his/her competitors.

creative and innovative capacity of the cluster as a whole due to knowledge spillover effects and local network dynamics. Personal ties between entrepreneurs spanning cluster boundaries are hypothesized to be crucial channels for the transfer of new, creative ideas, whereas local knowledge networks are hypothesized to mainly facilitate a 'local buzz' (Bathelt *et al.* 2004).

These observations appear to contradict the knowledge-based theory of clusters, which seeks to explain the existence of clusters based on their assumed value as facilitators of local knowledge dynamics (Arikan 2009; Malmberg and Maskell 2005; Maskell 2001). In addition, economic geographers nowadays consider knowledge exchange critical to assessing cluster performance (Tallman, Jenkins, Henry and Pinch 2004). Given the latest findings of Saxenian (2006) and Owen-Smith and Powell (2004), the dogmatic belief in knowledge dynamics being confined to predefined cluster boundaries appears to lack a sound theoretical and empirical basis. In particular, the role of geographical proximity as main facilitator for local knowledge dynamics appears to contradict with the apparent ease, speed, and significance of knowledge transfer spanning cluster boundaries. From the field of economic geography, this has resulted in a call for assessing other forms of proximity in facilitating knowledge dynamics among entrepreneurs, such as relational, cognitive, and epistemic proximity (Bunneil and Coe 2001; Gertler 2003). This requires us to critically approach both knowledge dynamics within and knowledge dynamics across cluster boundaries by making use of a relational perspective.

The discussion above reveals a fundamental question: *under what conditions of proximity can knowledge transfer successfully take place both within and across cluster boundaries?* Based on the knowledge-based theory of clusters, geographical proximity (i.e. being located in the same cluster) combined with some degree of cognitive proximity should be sufficient for facilitating learning (Boschma 2005). It appears, however, that the role of geographical proximity is overemphasized in explaining learning and knowledge transfer (Oinas 1999). Other forms of proximity have been suggested as facilitators, thus limiting the role of geographical proximity (Boschma 2005).

This article provides an empirical exploration of how different forms of proximity, including geographical proximity, interact in facilitating knowledge dynamics among entrepreneurs. In this study, the concept of knowledge dynamics is divided in two subcategories: interactive learning and ease of knowledge transfer. Both subcategories are recognized as important vehicles for understanding knowledge dynamics from both a geographical and relational perspective (Boschma 2005; Reagans and McEvily 2008). To study this, we turned our attention to entrepreneurs located in the Amsterdam IT- and New Media-cluster, the Netherlands (see methods-section for an elaboration).

In addition, we would like to use this article to draw attention to the concept of *epistemic proximity*, here defined as the degree to which two actors (ego and alter) share a common worldview. This concept emerged during the course of thirty-two preliminary interviews generated prior to the quantitative phase of this research, and takes in a distinctive role in the total pallet of proximities discussed in this article by serving as a prominent enabler of knowledge dynamics among entrepreneurs, both within and across cluster boundaries.

In raising this issue, we move away from perceiving the cluster as a ‘bounded region’ from a knowledge perspective, and instead adopt a social network perspective to interpret and understand innovative dynamics at a regional level. Or, as Thrift and Olds put it, “the network serves as an analytical compromise, in the best sense of the word, between the fixities of the bounded region metaphor and the fluidities of the flows metaphor” (1996: 333).

This article is structured as follows. First, in the theory section the various forms of proximity will come under discussion from a theoretical perspective, resulting in an integrative conceptual framework relating the various forms of proximity to the concept of interactive learning and ease of knowledge transfer. Second, the research methodology applied in testing the conceptual model is elaborated on, incorporating the research as well. Third, the results section discusses the relevant findings of testing the conceptual model. Fourth and final, the results and findings are discussed as to their implications for our current understanding of the process of interactive learning specifically, and (regional) innovation in general.

2. THEORY

The knowledge-based theory of clusters

The main claim of the knowledge-based theory of clusters involves the believe that clusters are effective vehicles for enhanced knowledge creation and communication, facilitated by the assumed positive influence geographical proximity has on knowledge dynamics among firms and entrepreneurs (Arikan 2009). Much work in this discipline, either implicitly or explicitly, is funneled by the underlying assumptions of the knowledge spillover-perspective, which considers clusters as spatially confined pools of knowledge only available to the actors located within its boundaries (Bell, Tracey and Heide 2009; Feldman and Francis 2004). This view, subsequently, conceptualizes innovation as a process involving joint action of cluster members. Such joint actions focused on innovation are facilitated by a regional social fabric that allows for trust, localized institutions and conventions to develop (Bell *et al.* 2009). Thus, the concepts of interactive local learning and ease of knowledge transfer helps explaining the

existence of clusters (Malmberg and Maskell 2005; Reagans and McEvily 2008). Departing from the knowledge-based theory of clusters, it logically follows that interactions among co-located actors have different, if not superior, qualities and outcomes compared to interactions among distant actors (*ibid.*). This makes the effect of geographical proximity on interactive learning a *key issue* in the field of economic geography (Boschma 2005).

Lately, the knowledge-based theory of clusters has been the subject of critique. First of all, as Oinas (1999) notes, there seems to be little empirical evidence available clearly demonstrating that the process of interactive learning is a predominantly local one. Rather, it is suggested, new knowledge creation and interactive learning is more likely to stem from a combination of local and non-local relationships (*ibid.*). In addition, concerns have been raised with respect to the significance of the local context. More specifically, it has been suggested that the impact of the local context on knowledge dynamics is somewhat overemphasized, not allowing other factors to enter the “geography of learning discourse” (Malmberg and Maskell 2005: 9), such as the role of other forms of proximity (Boschma 2005) or concepts like ‘communities of practice’ (Wenger 1998; Malmberg and Maskell 2005). It is especially deemed important, however, “to determine in more detail in what way the different dimensions of proximity are related to each other” (Boschma 2005: 72) when it comes down to facilitating knowledge dynamics among entrepreneurs.

To assess the role of geographical proximity in relation to other forms of proximity, two dependent variables are central in this article: ‘interactive learning’ and ‘ease of knowledge transfer’. Taken together, these concepts represent the knowledge-based theory of clusters, which posits that geographical proximity positively influences the amount of learning taking place among cluster-based actors (interactive learning) as well as the ease of transfer of the knowledge involved through facilitating the development of relationship-specific heuristics (ease of knowledge transfer) (Arikan 2009; Reagans and McEvily 2008). The four forms of proximity mentioned above are considered independent variables.

The remaining part of this theoretical section discusses how different forms of proximity can play a role in facilitating knowledge dynamics among entrepreneurs. More specifically, it is explored how different forms of proximity can serve as complement to geographical proximity in this matter. This review emphasizes the role of relational, cognitive, and epistemic proximity in addition to geographical proximity.

A conceptual framework of proximity

Relational proximity

The issue of relational proximity and its effect on interactive learning and ease of knowledge transfer relates to the notion of *embeddedness*, which can be regarded a response to the traditional economic (utilitarian) perception of behavior. The utilitarian perception of behavior assumes that actors act in a rational, self-interested fashion, and in doing so, are not or modestly hindered by social relations. The embeddedness perspective, in contrast, accepts the notion of relations posing a serious constraint on behaviors and institutions (Granovetter, 1985). Granovetter basically argues that the “level of embeddedness of economic behavior is more substantial than is allowed for by formalists and economists” (1985: 482). Similarly, relations are still a prime source for people to turn to when in need of knowledge or information. Having ready access to the Internet or a company’s intranet doesn’t change this general tendency to turn to people for knowledge (Levin and Cross 2004; Cross and Sproull 2004).

The embeddedness perspective is known for its seminal distinction between weak ties (low relational proximity) and strong ties (high relational proximity). Central is the effect of tie-strength on (knowledge and information) diffusion. This debate heavily relies on Granovetter’s (1973; 1983) ideas concerning the strength of weak ties. Essential to Granovetter’s argument is the notion that “whatever is to be diffused can reach a larger number of people, and travels greater social distance (...), when passed through weak ties rather than strong” (1973: 1366). The fundamental assumption is that the actors to whom one is weakly connected, will probably move in different social circles compared to one’s own, and thus will have access to different kinds of information (Granovetter 1973; 1983). Or, as Burt (1992: 47) emphasizes, “contacts strongly connected to each other are likely to have similar information and so provide redundant benefits.” Weak ties, hence, can for instance form a crucial bridge between two densely structured social networks (Granovetter 1983), and are consequently argued to be of importance in obtaining new information (e.g. regarding business opportunities).

Whereas weak ties are valuable in that they provide access to new information and knowledge, according to Granovetter (1983) strong ties have their advantages as well. Strong ties are usually more willing to help and generally are more easily available. In addition, stronger ties involve a higher degree of trust, making such ties more suitable for transferring tacit forms of knowledge and information exchange (Hansen 1999; Uzzi 1997; 1996). Finally, strong ties reduce the risk of opportunistic behavior. Combined, the characteristics of strong

ties are considered important in facilitating interactive learning. Effective interactive learning therefore requires a durable relationship, characterized by a high level of relation proximity, as opposed to arm's length ties (Boschma 2005; Uzzi 1997). This leads to the following hypothesis:

Hypothesis R1: higher relational proximity between ego and alter increases the amount of interactive learning taking place in that relationship.

Similarly, we posit that stronger ties are positively related to ease of knowledge transfer. Due to a higher frequency of contact, relation-specific heuristics will develop that foster shared understandings (Reagans and McEvily 2008), which consequently ease the transfer of knowledge (Uzzi 1997). In addition, stronger ties involve more trust, creating a sense of confidence that the knowledge that is transferred will not be used inappropriately (Reagans and McEvily 2008). Thus, we hypothesize the following:

Hypothesis R2: higher relational proximity between ego and alter increases the ease with which knowledge is being transferred between ego and alter.

Cognitive proximity

Knowledge is dispersed among different actors. Hence, it is consistent to conclude that interactive learning requires bringing together different knowledge from different, heterogeneous sources (Boschma 2005; Nooteboom 2000). Combining the input of heterogeneous agents, located in clusters different from one's own, is a difficult task especially given the tacit nature of the knowledge in question. Simple access to this knowledge, through either strong or weak ties, may not suffice. Instead, the effective transfer of knowledge requires a certain degree of cognitive proximity (Boschma 2005). More specifically, a certain amount of absorptive capacity is necessary for the effective exchange of knowledge to take place (Cohen and Levinthal 1990), for a high degree of absorptive capacity enhances one's ability to identify, interpret, and utilize new knowledge and information. As such, the degree of cognitive proximity between ego and alter is likely to influence the amount of learning taking place and the ease with which knowledge is being transferred between them. It is for instance assumed that acquiring new knowledge close to one's current knowledge base is less costly (Perez and Soete 1988).

The cognitive distance should not be too great for interactive learning to take place successfully. People sharing a high degree of proximity, presumably are better equipped to learn from each other. Cognitive proximity is assumed to facilitate effective communication between ego and alter (Boschma 2005), assuming a direct and positive linear relationship between the level of cognitive proximity and interactive learning. However, an equally strong case is made for allowing a certain degree of cognitive distance in order to enhance the process of interactive learning. It is argued that interactive learning and knowledge building requires a certain degree of dissimilarity. Basically, cognitive distance increases the potential for interactive learning, for building knowledge “often requires dissimilar, complementary bodies of knowledge” (*ibid.*: 63). In sum, this implies that some sort of balance needs to be established between cognitive distance and cognitive proximity in order for interactive learning to be effective.

Hypothesis C1: the amount of interactive learning taking place in a given ego-alter relationship has an inverted U-shaped relation with the level of cognitive proximity between ego and alter.

While some cognitive distance may be needed in order to secure the potential for learning something new, this may not be the case for the ease with which knowledge is transferred. Especially in the case of transferring non-codified knowledge, access alone does not suffice. “For the sake of communication, there must be sufficient cognitive overlap” (Boschma 2005: 64). Therefore, we hypothesize the following with respect to ease of knowledge transfer:

Hypothesis C2: higher cognitive proximity between ego and alter increases the ease with which knowledge is being transferred between ego and alter.

Epistemic proximity

Epistemic proximity involves the extent to which ego and alter share a similar world view. The more similar this shared understanding of reality, the higher the amount of epistemic proximity between ego and alter. This concept can serve as a powerful complement to geographical proximity because it bridges the contextual and cultural gap associated with interactions that are geographically distant.

Epistemic proximity differs conceptually from cognitive proximity in the sense that the latter deals with cognition and knowledge background (as explained above), while the former

deals with a belief system and world view. Ones' epistemic understanding of reality can be viewed as the result of a personal sensemaking process (Weick 1995) influenced by one's physical and social environment. In relation to the context of the article, it involves an actor's view of the current state of the industry as well as in what direction the industry *should* develop (Faulconbridge 2006; Blanc and Sierra, 1999).

In a sense, the concept of epistemic proximity closely matches social world theory which deals with "structures consisting of individuals with a shared collective interest" (Elkjaer and Huysman 2008: 172). Social worlds are "groups with shared commitments to certain activities, sharing resources of many kinds to achieve their goals, and building shared ideologies about how to go about their business" (Clarke 1991: 131). The building of shared ideologies, or ideal types of the future, is of central importance with respect to the concept of epistemic proximity.

The concept of epistemic proximity emerged in the course of thirty-one qualitative interviews with entrepreneurs, conducted in preparation of studying the interaction effects across relational, cognitive, and geographical proximity and their influence on knowledge dynamics among entrepreneurs. Many of the entrepreneurs interviewed notice the importance of having ties to people outside the cluster in order to take part in or keep informed about fundamental developments taking place in the industry. As one entrepreneur recalled:

"You know, as I see it there are two kinds of creativity. There is market creativity with respect to the Netherlands, I have to do something in the Dutch market you know, versus long-term undercurrents, and those long-term undercurrents stem from bigger markets and people with broader visions, who are involved in those fundamental developments and who spent a lot of time and effort in attending these conferences to invest in things globally, which of course is very inspiring. (...) To me this is important as it helps me to decide in what to invest." (R17).

Examples of such debates are legion (Benkler 2006). One striking illustration of a debate exemplary for *long-term undercurrents* to which the respondent above refers, is conveyed under the heading of the 'semantic web'. Under the semantic web-umbrella, issues are addressed relating to the future structure and role of the Internet. More specifically, an ideal type vision is advocated in which the Internet is structured and designed such that it is able to provide meaning to all content on the web, allowing software to reason and understand (semantic = meaning). It is subsequently envisioned that an Internet characterized by high

degrees of semantic understanding is better able to respond to its users' needs, allowing society to truly progress into a knowledge society. Entrepreneurs active in the realm of the Internet and new media are regularly confronted with fundamentally new, technological developments adhering to this philosophy, enforcing the entrepreneur to take in a position. Differences in attitude or opinion towards developments related to the semantic web-debate or -movement imply a difference in world view or belief system. This difference or similarity characterizing a given ego-alter relationship is expressed by its degree of epistemic proximity.

The value of epistemic proximity in facilitating knowledge dynamics can take form in two ways. First, for interactive learning to be fruitful, it requires a certain base to build upon. Epistemic proximity can provide fruitful ground for interactive learning to take place, for it implies a strong mutual loyalty to a shared problem or goal (i.e. future desired state) (Amin and Roberts 2008). Given that the IT and new media world houses many different disciplines, implying cognitive friction and weak ties among them, epistemic proximity can form a crucial bridge in motivating people to engage in learning, despite possible cognitive or relational distance. Therefore, the following is suggested:

Hypothesis E1: the level of epistemic proximity between ego and alter is directly and positively related to the amount of interactive learning taking place in a given ego-alter relationship.

Second, sharing a certain degree of epistemic proximity with a given alter can influence the ease of knowledge transfer between ego and alter, for negotiating a shared world view as a consequence of institutional and cultural differences is unnecessary. As such, ego and alter already share a similar understanding of reality, providing them with a similar context to discuss certain issues.

Hypothesis E2: higher epistemic proximity between ego and alter increases the ease with which knowledge is being transferred between ego and alter.

Geographical proximity and interactive learning

Central to the ascribed importance of clusters to innovation and regional renewal lies the conviction that innovation stems from local interactions primarily (Oinas 1999). Put differently, "intellectual breakthroughs must cross hallways and streets more easily than oceans and continents" (Glaeser, Kallal, Scheinkman and Shleifer 1992: 1127). Closely linked

actors are assumed to benefit from collective learning processes that are bound to a certain locality. The role of tacit knowledge, trust, and local institutions are stressed to have a significant effect on the process of accumulation of knowledge. As such, a high degree of geographical proximity among actors is, *a priori*, considered to stimulate and enhance mutual learning processes. Or, as Amin and Cohendet (2004: 90) assert, “learning and innovation are cast as regional properties, with spatial proximity and local belonging read as the vital economic asset for learning-based competitiveness.” The role of geographical proximity in facilitating interactive learning and ease of knowledge transfer remains unclear, however, especially given the possible influence of other forms of proximity. As discussed above, other forms of proximity possibly act in relation with geographical proximity (Boschma 2005).

For analytical reasons, we define geographical proximity in a very confined manner. Geographical proximity refers to the physical distance among economic actors. Actors who are physically close, are assumed to benefit from knowledge externalities or spillover effects. Such claims are based on patent research primarily, showing that firms located in clusters or near knowledge sources are more innovative (Jaffe, Trajtenberg and Henderson 1993). Based on this research it is claimed that the larger the distance between ego and alter, “the less the intensity of these positive externalities, and the more difficult it becomes to transfer tacit knowledge” (Boschma 2005: 69).

However, in discussing the other forms of proximity, it has become clear that the value of clusters from a knowledge-based perspective might lie in strengthening these various forms of proximity, thus facilitating the interactive learning process indirectly. For instance, geographical proximity can facilitate the creation and maintenance of informal ties (Audretsch and Stephan 1996). In addition, geographical proximity can strengthen cognitive proximity by facilitating spillover effects (Malmberg and Maskell 2005). With respect to epistemic proximity, it is imaginable that being part of the same cluster aids the creation of a shared view between ego and alter. Accordingly, geographical proximity might have an effect on the degree of epistemic proximity between ego and alter, which consequently affects the amount of interactive learning and ease of knowledge transfer (E1 and E2). This leads us to the following hypothesis:

Hypothesis G1: The degree of geographical proximity in a given ego-alter relationship is indirectly related to the amount of interactive learning and ease of knowledge transfer characterizing that relationship, by positively strengthening the degree of relational, cognitive, and epistemic proximity of that relationship.

Taking the above into account, this leads to the following theoretical model:

Figure 1 about here ³

3. METHODS

This methods-section starts with discussing the research context in which this study was carried out. Subsequently, this section elaborates on the sample, data, and measures employed in this study.

The Amsterdam IT and new media-cluster

The stage for this study is the Amsterdam-based IT and new media-cluster, located in the greater Amsterdam area (the Netherlands). This cluster was identified by Leisink (2000) and the OECD (2002), and acknowledged as the region in the Netherlands with exceptionally high concentrations of IT, Internet, and new media related business activity. The Amsterdam IT and new-media cluster (henceforth AINM-cluster) is recognized for housing four interrelated activities: (1) multimedia enabling activities, (2) content distribution activities, (3) content provision activities, and (4) e-marketing/ advertising (Den Hertog, Brouwer, Maltha 2000). Fifteen percent of all jobs in the Dutch creative industries are located in the Amsterdam region (while the relative share of all Amsterdam-based jobs in the Dutch economy is 6,4 percent).

The AINM-cluster appears to be an ideal case for studying knowledge dynamics in the context of the local-global paradox. Whereas local policymakers stress the importance of the local context for innovation and regional economic renewal (echoing the works of Michael Porter and Richard Florida), Amsterdam-based entrepreneurs seem to stress the importance of tapping into the global buzz. To quote one entrepreneur on this issue with whom we had an interview prior to our quantitative study:

“(...) we have a global network through which we learn about numerous things that are going on globally, but that do not seem to be on the agenda in the Netherlands. (...) You have a network of people through which one learns of the developments that

³ This model does not incorporate all hypotheses for reasons explained in the results section.

matter very quickly, and that allows you very quickly to find yourself in a context in which sensemaking takes place.” (R3)

In addition, the AINM-cluster is affected by developments taking place at a larger scale. The production of culture, information, knowledge and innovations has changed dramatically over the course of the past two decades (Benkler 2006). Increasingly, it appears, the production of information, knowledge, and innovations is the domain of social production mechanisms irrespective of geographical boundaries and obstacles (*ibid.*). The development of the GNU/Linux-operating system, with more than one million registered users and contributors worldwide, serves as a successful example of the social production of innovations.⁴

Such developments imply a fundamental shift in the production and dissemination of knowledge, being “radically decentralized, collaborative, and nonproprietary” (Benkler 2006: 60). Important to note in this respect is that this development is of a highly ideological and pervasive nature, influencing all IT and Internet related disciplines and industries in a fundamental way (*ibid.*). Debates characterizing this development revolve around open-source software and the semantic web, and take place at an international level. Such debates contribute to the construction of shared world views, resulting in non-territorial structures of individuals with a shared collective interests (Elkjaer and Huysman 2008).

This makes the AINM-cluster an interesting case to study the influence of geographical, relational, cognitive, and epistemic proximity on knowledge dynamics among entrepreneurs. First of all, it offers the possibility to assess the relative impact of both local and non-local ties on knowledge dynamics among entrepreneurs. In addition, the pervasiveness of the open-source model, the free software movement, and the semantic web development creates a strong impetus for critically approaching the geography of learning-discourse (Maskell and Malmberg 2005). Our focus on the AINM-cluster also implies a shift away from so-called science-based clusters or regions (like biotechnology), which are involved in the development of technical knowledge primarily (Tallman and Phene 2007; Owen-Smith and Powell 2004). We suggest that our considerations with respect to the AINM-cluster are to be perceived in the context of professional services-based clusters instead, to which industries such as IT consulting and design, advertising, marketing, software development, media production, et cetera, are allocated (Von Nordenflycht 2010). It is generally acknowledged that such

⁴ The development of the GNU/Linux-operating system serves as an example of free software development through peer production. Other examples might include Wikipedia.org, the clickworkers-experiment by NASA, or the SETI@home-project (Benkler 2006).

innovative services “require high levels of expertise and awareness of the latest dynamics of the marketplace served” (Faulconbridge 2007: 970), implying that the benefits that accrue from interactive learning and knowledge transfer are potentially of great value to the firms involved.

Sample and data

To test the hypotheses, we collected ego-network data among fifty entrepreneurs active in the AINM-cluster from May – August 2009. Preceding the data generation phase, a list of 339 entrepreneurs was created. In constructing the list of entrepreneurs, we made use of membership-databases of two Amsterdam-based network clubs, known for having many entrepreneurs among their members. The list was completed by adding names generated through LinkedIn, a popular social network-tool among Amsterdam-based IT and new media-entrepreneurs. We undertook this last step to certify that all disciplines active in the AINM-cluster were represented in this list, assuring a good representation of the Amsterdam AINM-cluster and preventing a sample bias; the list consisted out of entrepreneurs active in various fields, ranging from IT, Internet, gaming, e-marketing and advertising, new media, software, et cetera.

The questionnaires were designed to generate relational data. We randomly requested entrepreneurs to participate in our research by putting the entrepreneurs’ names in random order and administer the questionnaire to every third entrepreneur on the list. This was done until we had generated fifty fully filled-in questionnaires. These fifty ego-networks resulted in 418 dyadic relationships (i.e. ego-alter relationships) that form the unit of analysis for this article (i.e. $N = 418$).

The questionnaire consisted of name generator questions, relationship interpretation questions and similarity measures. Table 1 provides a detailed account of the content and range of this questionnaire. The questionnaire was pretested among seven academic colleagues as well as three entrepreneurs active in IT, Internet, and/or new media. The pretesting resulted in adjusting some of the wording of particular survey-items, as well as some slight adjustments to some of the answer-categories.

The questionnaire starts with four so-called name generator questions. This type of question serves the purpose of eliciting names of people (alters) relevant to the respondent (ego). The goal of the name generator questions was to elicit alters who are important to ego from a knowledge-based perspective. Thus, ego was asked to recall alters who are specifically important to him or her with respect to generating information and knowledge. The first two

name generator questions (NG1 and 2, table 1) were specifically designed to elicit relatively strong alters from ego. The final two name generator questions (NG3 and 4, table 1) were aimed at probing for weak ties as well. Important to note is that the name generators were specifically designed to capture non-codified or tacit knowledge, for the notion of tacit knowledge is of central importance to the knowledge-based theory of clusters (Broekel and Binder 2007). As such, this design moves away from capturing articulated technology flows, as would be the case when focusing on patents (Tallman and Phene 2007).

The questionnaire applied a so-called *free recall* design, allowing egos to freely generate a set of alters based on the name generator questions that were being administered to them. In addition, egos were allowed to mention as little or as many alters as they considered appropriate (i.e. *free choice* design). No fixed amount of alters was specified in advance.

Measures

Independent variables

The four types of proximity introduced above represent the independent variables for this study. *Geographical proximity* was measured by having the respondent (i.e. ego) indicate his/her own physical business location as well as the (business) location of each of his/her contacts (alters). This information was categorized afterwards into three types: 1) ego-alter relations crossing cluster boundaries as well as national boundaries, 2) ego-alter relations crossing cluster boundaries yet confined by national boundaries, and 3) ego-alter relations confined to cluster boundaries (similar to Tallman and Phene 2007).

Relational proximity was measured by having the respondent indicate the frequency of contact with each of his/her alters as well as the degree of emotional closeness characterizing each relationship. In line with Burt (1997), both items were measured using a four item scale. *Cognitive proximity* was measured by having the ego indicate the extent to which he/she shared similar work-related knowledge with each of his/her alters. The phrase work-related knowledge was used to capture knowledge dynamics relevant to the process of doing and running a business. *Epistemic proximity* was measured by having the ego indicate to what extent his/her attitude towards fundamental developments in his/her field was similar or different to each of his/her contacts. These two similarity-measures both consist of a one-item scale (see table 1). Reason for this is the time-constraint. Taking a social network questionnaire can be a time-consuming endeavor for the respondent involved.⁵ For both items

⁵ It is not unusual in social network-research to apply 1 or 2-item scales. See for instance Rodan and Galunic 2004 or Borgatti and Cross 2003.

we initially adopted Rodan and Galunic's (2004) item scales. Pretesting the scales, however, suggested adding a fifth answer-category, namely 'don't know.'

Table 1 about here

Dependent variables

This study incorporates two dependent variables: interactive learning and ease of knowledge transfer. *Interactive learning* was measured using a three items scale. First, the respondent was asked to indicate the frequency of knowledge and information exchange between him-/herself and each of his/her alters. In order to establish this, respondent was requested to answer two questions: 1) how frequent respondent approached each of his/her alters with a knowledge or information request, and 2) how often each of his/her alters approached respondent with a knowledge or information request. This was done in order to capture the degree of interaction between ego and alter. The interactive learning-variable was complemented by having respondent indicate the significance or value of each interaction involved. A reliability-analysis revealed a Cronbach's alpha of .69.

The second dependent variable, *ease of knowledge transfer*, was measured using a one-item scale. This item requested the respondent to indicate how easy he/she considered it to explain a key concept or idea from his discipline to each of his/her alters (see table 1).

Testing the model through structural equation modeling

Although researchers have powerful statistical tools at their disposal, such as multiple regression, multivariate analysis of variance, discriminant analysis, et cetera, such techniques allow a researcher to examine only a single relationship at a time (Hair, Black, Babin, Anderson and Tatham 2006). Structural equation modeling (SEM) allows the researcher to test theoretical propositions in a multivariate setting, and therefore can be considered a useful tool in the development of theory (Marcoulides and Heck 1993). It allows a researcher to define a model "to explain the entire set of relationships" (Hair *et al.* 2006: 711). The advantage of SEM over more 'traditional' methods is that it allows one to simultaneously approximate the fit of measurement and structural models. Given the specific focus, complexity, and objective of this study, that is, the interrelationship among various forms of

proximity in facilitating interactive learning and ease of knowledge transfer, SEM is a proper tool for testing such a multivariate model.

4. RESULTS

As an introduction to this section, table 2 provides an overview of some descriptive information concerning the fifty ego-respondents from which the 418 ego-alter relationships were solicited. The apparent overrepresentation of male entrepreneurs (as opposed to female entrepreneurs) can be explained by the research domain, i.e. the AINM-cluster. Reviewing member lists from local network associations, we found a similar overrepresentation male entrepreneurs.

Table 2 about here

The conceptual model (see figure 1) was tested using AMOS 5, and served as the guideline for our structural equation modeling. Figure 2 shows the model with both the best fit and theoretical relevance:

Figure 2 about here

Model fit

A number of goodness-of-fit measures were used to determine the extent to which this model fits reality as represented by the data. First, we consulted the Comparative Fit Index (CFI). This index is one of the most widely used fit-indexes because of its relative insensitivity to model complexity (Hair *et al.*, 2006). Values of the CFI range between 0 and 1, with higher values implying a better fit. Required values are dependent on the number of observations/cases and model complexity (i.e. the number of variables). Once the number of observations exceeds 250 (in our case $N = 418$), and the number of variables is below 12 (in our case 6), then the CFI should be .95 or higher (*ibid.*). In the case of this model, the CFI is .996, and thus meets the formal requirements. In addition to the CFI, the Tucker Lewis Index (TLI) is often consulted for assessing the model fit. The TLI is similar to the CFI and should indicate

similar values. In the case of our model, the TLI reports a value of .99, thus indicating a good model fit as well. Both the CFI and the TLI provide a good indication of the overall model fit.

Another important measure of fit is the Root Mean Square Error of Approximation (RMSEA). The RMSEA is a measure of the unexplained (co)variances in the model. A low RMSEA-score indicates a good fit. For models involving more than 250 observations and less than 12 variables, the RMSEA-value should be lower than .07. The RMSEA of our model is .0223, and thus meets the formal requirements (Hair *et al.*, 2006). Finally, the relative chi-square (CMIN/DF) should be lower than 3 or, preferably, 2. In the case of our model, the CMIN/DF is 1.225. The model's Chi-square has a value of 9.8 with 8 degrees of freedom, leading to a chance probability of .2793. This has no implications for our model fit (Hair *et al.*, 2006). Table 3 summarizes these findings.

Table 3 about here

Our present structural equation model assumes linearity among the variables, whereas hypothesis C1 proposed a non-linear relationship between the amount of learning and the level of cognitive proximity in a relationship. We checked for the hypothesized inverted U-shape relation by dividing the interactive learning variable in two sets, expecting to find a positive linear relationship for low levels of cognitive proximity and a negative linear relationship for high levels of cognitive proximity. Based on this analysis, we were not able to substantiate an inverted U-shape relation in this matter. A subsequent correlation-test suggested a linear relationship, which is confirmed through structural equation modeling. With respect to the effect of geographical proximity on interactive learning and ease of knowledge transfer, we additionally checked for a direct relation. No direct effect was found between geographical proximity and both dependent variables, suggesting that the effect of geographical proximity on interactive learning is indeed mediated by relational proximity as exhibited by the empirical model (figure 2). Table 4 summarizes what these results imply with respect to the hypotheses.

Table 4 about here

5. CONCLUSION and DISCUSSION

The findings strongly suggest to reconsider the role of geographical proximity in facilitating interactive learning and ease of knowledge transfer among actors. The model presented in figure 2 clearly shows that interactive learning and ease of knowledge transfer are mainly facilitated by relational, cognitive, and epistemic proximity. Geographical proximity plays a limited role, by weakly facilitating relational proximity.

By identifying the effects of each dimension of proximity on interactive learning and ease of knowledge transfer, we are now able to isolate and assess the relative impact of geographical proximity in this matter. From the analysis it appears that the bounded region metaphor, to which Thrift and Olds (1996) refer, is in need of re-conceptualization indeed. It is reasonable to question the proclaimed role of geography in the geography of learning-discourse. From the data presented in this article, there is no evidence to suggest that interactive learning is enhanced because of mechanisms related to spatial proximity. Geographical proximity does not directly influence interactive learning and ease of knowledge transfer, nor does it play a dominant role by strengthening other forms of proximity, as suggested by Boschma (2005).

The data, as presented by the empirical model (figure 2), suggest an interesting and significant role for the concept of epistemic proximity. At the very least, the concept of epistemic proximity should become a part of the vocabulary of the knowledge-based theory of clusters, for it clearly influences both ease of knowledge transfer and interactive learning (albeit indirectly). The logic behind the role of epistemic proximity relates to social world theory; having similar ideological representations of the future invokes the sharing of resources of various kinds, including knowledge and information. A high level of epistemic proximity possibly motivates actors to share knowledge (though not measured in this study) and eases the process of sharing knowledge, for ego and alter do not necessarily need to negotiate a shared world view.

Epistemic proximity, by definition, is not bounded by geographical borders. Rather, it is bounded by “the limits of effective communication” (Shibutani 1955: 566). This implies that in today’s world, where sophisticated communication technologies have become ubiquitous, geographical distance should not necessarily represent an obstacle in the process of interactive learning. The amount of interactive learning is dependent on other aspects of the relationship

involved, suggesting that previous explaining models of local learning are too much inward looking (Oinas 1999).

The role of epistemic proximity also has implications for the concept of local buzz (Bathelt *et al.* 2004). This concept basically involves “specific information and continuous updates of this information, intended and unanticipated learning processes in organised and accidental meetings, the application of the same interpretative schemes and mutual understanding of new knowledge and technologies, as well as shared cultural traditions and habits within a particular technology field, which stimulate the establishment of conventions and other institutional arrangements” (*ibid.*: 38). This concept has been put forward to differentiate between local and non-local knowledge flows (i.e. the pipeline thesis), arguing that local buzz is a form of exchange predominantly reserved to cluster based entrepreneurs and firms. However, the data suggest that learning processes, whether intended or not, cross cluster boundaries fairly easy, suggesting that the concept of local buzz has a global or inter-local equivalent: global buzz.

A number of relationships appear in the empirical model (figure 2) that are not hypothesized in the conceptual model (figure 1). Specifically, a negative linear relationship was found between relational proximity and epistemic proximity ($b = -.190$; $p < .01$), and a positive linear relationship was found between cognitive proximity and epistemic proximity ($b = .319$; $p < .01$). In addition, a positive linear relationship was found between ease of knowledge transfer and interactive learning ($b = .086$; $p < .05$). To our knowledge, there is no theoretical explanation available for any of these relationships at present.

The negative relationship between relational and epistemic proximity ($b = -.190$; $p < .01$) is an intriguing one, especially since it feels counterintuitive. The negative relationship found for these two variables implies that the stronger the tie between any given ego and alter, the greater the epistemic distance and, thus, the more likely they are to differ in their opinion about web2.0 related issues. A logical, yet speculative, explanation might be that the better ego and alter are acquainted the better ego and alter are equipped to register subtle yet critical differences in world view. On the one hand, this could possibly hamper the ease of knowledge transfer and learning for ego and alter are likely to debate epistemic details, meaning that epistemic proximity can play a negative role in facilitating knowledge dynamics through strong ties. On the other hand, it also implies that epistemic proximity can play a positive role in facilitating knowledge dynamics across distant ties, both relationally and geographically. However, this remains speculation.

The positive relationship between cognitive and epistemic proximity appears more logical ($b = .319$; $p < .01$). Intuitively, it is more likely that two individuals sharing a similar knowledge background on, in this case, Internet, IT and new media, share similar convictions on its use, practicality, and value. It enables both to comprehend and discuss small and grand developments in their respective disciplines, allowing them to reach consensus on an epistemic level. However, again, this remains speculative.

To recapitulate, this article set out to explore the relative importance of geographical proximity in facilitating interactive learning and ease of knowledge transfer, by taking into account other forms of proximity. This allowed for a critical approach of the knowledge-based theory of clusters, which holds clusters as valuable and exclusive domains of knowledge. From this perspective, geographical proximity is considered to be a main facilitator of local knowledge dynamics and is regarded a key issue in the field of economic geography.

The theory claims that geographical proximity increases the frequency with which actors communicate as well as the effectiveness of the knowledge that is being transferred (Arikan 2009; Bathelt *et al.* 2004). The theory fails, however, to specify precisely the role of other forms of proximity in facilitating interactive learning and knowledge transfer, and thereby the exact role of geographical proximity in this matter (Boschma 2005). In addition, the knowledge-based theory of clusters fails to explain or account for successful knowledge interactions crossing cluster boundaries (Owen-Smith and Powell 2004; Saxenian 2006).

Lately, it has been suggested that the role of the local spatial context (i.e. geographical proximity) in facilitating interactive learning and ease of knowledge transfer is overstated (Oinas 1999; Malmberg and Maskell 2005). Other forms of proximity have been suggested to play a distinct part in facilitating interactive learning (Boschma 2005). In this article we looked at the role of relational, cognitive, and epistemic proximity in addition to geographical proximity. The main contribution of this article, thus, is an empirically falsified model that provides a detailed understanding of how these forms of proximity interact in facilitating interactive learning and ease of knowledge transfer among entrepreneurs.

Introducing and measuring the concept of epistemic proximity is the second main contribution of this study. Having its roots in social world theory (Elkjaer and Huysman 2008; Shibutani 1955), the concept of epistemic proximity not only provides us with a better understanding of the process by which interactive learning is enhanced and facilitated, but also directs our attention beyond the cluster concept in understanding knowledge dynamics

and innovation. Thus, the concept of epistemic proximity is central in our critical approach of the knowledge-based theory of clusters.

This study does have limitations. First, part of the knowledge-based logic of the existence and value of cluster relies on the notion of competition monitoring and local labor market dynamics. These aspects are not taken into account in this study, meaning that clusters might still be of value in this respect (Malmberg and Maskell 2005). Second, a cluster can aid in the development of other forms of proximity not taken into account in this study, such as organizational or institutional proximity (Boschma 2005). Third, the present model does not distinguish between different forms or categories of knowledge. It would for instance be interesting to observe whether learning interactions involving new ideas differ from learning interactions involving advice or buzz. Fourth, this study is cross-sectional, and does not assesses the effect of geographical proximity on the other forms of proximity over time. Finally, as explained above, the results reported in this study might not be applicable to other types of clusters, most notably science-based clusters (Owen-Smith and Powell 2004).

These limitations, on the other hand, offer interesting and possibly fruitful venues for future research. At present, it remains unclear to what extent the concept of epistemic proximity is applicable to industries and disciplines other than IT, Internet, and new media. It is conceivable that other industries or disciplines are less ideologically inclined and, thus, subject to other combinations of proximity in relation to knowledge dynamics. Such subtle differences between clusters can possibly serve as explanations for different research outcomes in the matter of (local) knowledge dynamics. In relation to this, the interaction among the different forms of proximity is, in our view, a promising future research venue as well. To our knowledge, literature explaining interactions among various forms of proximity is in short supply.

In addition, as suggested above, we regard it necessary to distinguish more precisely between different forms of knowledge or learning interactions. Thus, we propose to move away from the present crude distinction between codified and non-codified knowledge interactions, and adopt a different, more precise, vocabulary in researching knowledge and learning processes (see for instance Amin and Roberts 2008).

Finally, other forms of proximity possibly play a role in facilitating local and inter-local learning and knowledge dynamics, but were not taken into account in this study for reasons explained above. In our opinion, the concept of institutional proximity has promising explanatory value with respect to understanding local and inter-local knowledge dynamics,

and thus might shed a different light on the role of geographical proximity. At present, however, we regard the concept of institutional proximity as one that lacks conceptual clarity to be successfully tested quantitatively, and call for more work on this issue.

Notwithstanding these limitations and associated future research venues, we strongly believe that this study touches upon a number of fundamental concerns related to the knowledge-based theory of clusters, thus providing a basis for further theorizing on this matter. At the very least, this study calls upon future research to look beyond the boundary of the cluster in the course of understanding innovation and learning.

REFERENCES

- Amin, A. & Cohendet, P. (2004). *Architectures of knowledge. Firms, capabilities, and communities*. New York: Oxford University Press.
- Amin, A. & Roberts, J. (2008). Knowing in action: beyond communities of practice. *Research Policy*, doi: 10.1016/j.respol.2007.11.003.
- Arikan, A.T. (2009). Interfirm knowledge exchanges and the knowledge creation capability of clusters. *Academy of Management Review*, 34(4), 658-676.
- Audretsch, D.B. & Stephan, P.E. (1996). Company-scientist locational links: the case of biotechnology. *The American Economic Review*, 86(3), 641-652.
- Bahlmann, M.D. & Huysman, M.H. (2008). The emergence of a knowledge-based view of clusters and its implications for cluster governance. *The Information Society*, 24(5), 304-318.
- Bathelt, H., Malmberg, A. & Maskell, P. (2004). Clusters and knowledge: local buzz, global pipelines and the process of knowledge creation. *Progress in Human Geography*, 28(1), 31-56.
- Baum, J.A.C., Calabrese, T., & Silverman, B.S. (2000). Don't go at it alone: alliance network composition and startups' performance in Canadian biotechnology. *Strategic Management Journal*, 21, 267-294.
- Bell, S.J., Tracey, P. & Heide, J.B. (2009). The organization of regional clusters. *Academy of Management Review*, 34(4), 623-642.
- Benkler, Y. (2006). *The wealth of networks. How social production transforms markets and freedom*. New Haven: Yale University Press.
- Blanc, H. & Sierra, Ch. (1999). The internationalisation of R&D by multinationals: a trade-off between external and internal proximity. *Cambridge Journal of Economics*, 23, 187-206.

- Borgatti, S. & Cross, R. (2003). A relational view of information seeking and learning in social networks. *Management Science*, 49(4), 432-445.
- Boschma, R.A. (2005). Proximity and innovation: a critical assessment. *Regional Studies*, 39(1), 61-74.
- Broekel, T. & Binder, M. (2007). The regional dimension of knowledge transfers – a behavioral approach. *Industry and Innovation*, 14(2), 151-175.
- Bunnett, T. & Coe, N. (2001). Spaces and scales of innovation. *Progress in Human Geography*, 25, 569-589.
- Burt, R.S. (1997). A note on social capital and network content. *Social Networks*, 19, 355-373.
- Burt, R.S. (1992). *Structural holes: the social structure of competition*. Cambridge, MA.: Harvard University Press.
- Clarke, A. E. (1991). Social worlds/arenas theory as organizational theory. In D. R. Maines (Ed.), *Social organization and social process. Essays in the honor of Anselm Strauss* (119-158). New York: Aldine de Gruyter.
- Cohen, W.M. & Levinthal, D.A. (1990). Absorptive capacity: a new perspective on learning and innovation. *Administrative Science Quarterly*, 35, 128-152.
- Cross, R. & Sproull, L. (2004). More than an answer: information relationships for actionable knowledge. *Organization Science*, 15(4), 446-462.
- Den Hertog, P., Brouwer, E. & Maltha, S. (2000). *Innovation in an adolescent cluster: the case of the Dutch multimedia cluster*. Paper prepared for the 3rd OECD cluster focus group workshop “Do clusters matter in innovation policy?”, May 8-9, Utrecht.
- Elkjaer, B. & Huysman, M.H. (2008). Social worlds theory and the power of tension, in D. Barry and H. Hansen (eds). *The SAGE Handbook of New Approaches to Management & Organization*, 170-177. Sage: London.
- Faulconbridge, J.R. (2007). Exploring the role of professional associations in collective learning in London and New York’s advertising and law professional-service-firm clusters. *Environment and Planning A*, 39, 965-984.
- Faulconbridge, J.R. (2006). Stretching tacit knowledge beyond a local fix? Global spaces of learning in advertising professional service firms. *Journal of Economic Geography*, 6, 517-540.
- Feldman, M.P. & Francis, J.L. (2004). Homegrown solutions: fostering cluster formation. *Economic Development Quarterly*, 18(2), 127-137.

- Gertler, M.S. (1995). 'Being there': proximity, organization, and culture in the development and adoption of advanced manufacturing technologies. *Economic Geography*, 71, 1-26.
- Gertler, M.S. (2003). Tacit knowledge and the economic geography of context, or the undefinable tacitness of being (there). *Journal of Economic Geography*, 3, 75-99.
- Gertler, M.S. & Levitte, Y.M. (2003). *Local nodes in global networks: the geography of knowledge flows in biotechnology innovation*. Paper presented at the Druid Summer Conference 2003 on Creating, Sharing, and Transferring Knowledge. The Role of Geography, Institutions and Organizations. June 12-14, Copenhagen (Denmark).
- Glaeser, E., Kallal, H., Scheinkman, J.A. & Shleifer, A. 1992. Growth in cities. *Journal of Political Economy*, 100(6), 1126-1152.
- Granovetter, M.S. (1973). The strength of weak ties. *The American Journal of Sociology*, 78(6), 1360-1380.
- Granovetter, M.S. (1983). The strength of weak ties: a network theory revisited. *Sociological Theory*, 1, 201-233.
- Granovetter, M.S. (1985). Economic action and social structure: the problem of embeddedness. *The American Journal of Sociology*, 91(3), 481-510.
- Hair, J.F., Black, W.C., Babin, B.J., Anderson, R.E. & Tatham, R.L. (2006). *Multivariate data analysis*. Pearson Prentice Hall: New Jersey.
- Hansen, M.T. (1999). The search-transfer problem: the role of weak ties in sharing knowledge across organizational subunits. *Administrative Science Quarterly*, 44(1), 82-111.
- Jaffe, A.B., Trajtenberg, M. & Henderson, R. (1993). Geographic localization and knowledge spillovers as evidenced by patent citations. *Quarterly Journal of Economics*, 108, 577-598.
- Lam, A. (1997). Embedded firms, embedded knowledge: problems of collaboration and knowledge transfer in global cooperative ventures. *Organization Studies*, 18(6), 973-996.
- Leisink, P. (2000). Multimedia industry networks and regional economic development policies: the case of the Netherlands. *Vierteljahrshefte zur Wirtschaftsforschung*, 69(4), S574-586.
- Levin, D.Z. & Cross, R. (2004). The strength of weak ties you can trust: the mediating role of trust in effective knowledge transfer. *Management Science*, 50(11), 1477-1490.
- Malmberg A. & Maskell, P. (2005). Localized learning revisited. *DRUID working paper no. 05-19*, pp. 1-17.
- Marcoulides, G.A. & Heck, R.H. (1993). Organizational culture and performance: proposing and testing a model. *Organization Science*, 4(2), 209-225.

- Maskell, P. (2001). Towards a knowledge-based theory of the geographical cluster. *Industrial and Corporate Change*, 10(4), 921-943.
- Nooteboom, B. (2000). *Learning and innovation in organizations and economies*. Oxford University Press: Oxford.
- Nordenflycht, A. Von (2010). What is a professional service firm? Toward a theory and taxonomy of knowledge-intensive firms. *Academy of Management Review*, 35(1), 155-174.
- OECD (2002). *Innovative people*. OECD Publications: Paris.
- Oinas, P. (1999). Activity-specificity in organizational learning: implications for analysing the role of proximity. *GeoJournal*, 49, 363-372.
- Owen-Smith, J., & Powell, W.W. (2004). Knowledge networks as channels and conduits: the effects of spillovers in the Boston biotechnology community. *Organization Science*, 15(1), 5-21.
- Perez, C. & Soete, L. (1988). Catching up in technology: entry barriers and windows, in Dosi, G., Greeman, C., Nelson, R., Silverbert, G. & Soete, L. (eds.). *Technical change and economic theory*, 458-479. Printer, London.
- Perry-Smith, J.E. (2006). Social yet creative: the role of social relationships in facilitating individual creativity. *Academy of Management Journal*, 49(1), 85-101.
- Porter, M.E. (1990). *The competitive advantage of nations*. New York: The Free Press.
- Porter, M.E. (1998). Clusters and the new economics of competition. *Harvard Business Review*, November-December, 77-90.
- Reagans, R. & McEvily, B. (2008). Contradictory or compatible? Reconsidering the “trade-off” between brokerage and closure on knowledge sharing. *Advances in Strategic Management*, 25, 275-313.
- Reagans, R. & McEvily, B. (2003). Network structure and knowledge transfer: the effects of cohesion and range. *Administrative Science Quarterly*, 48(2), 240-267.
- Rodan, S. & Galunic, C. (2004). More than network structure: how knowledge heterogeneity influences managerial performance and innovativeness. *Strategic Management Journal*, 25, 541-562.
- Saxenian, A. (2006). *The new Argonauts. Regional advantage in a global economy*. Cambridge: Harvard University Press.
- Schumpeter, J.A. (1934). *The theory of economic development. An inquiry into profits, capital, credit, interest, and the business cycle*. Cambridge: Harvard University Press.
- Sole, D. & Edmondson, A. (2002). Situated knowledge and learning in dispersed teams. *British Journal of Management*, 13, S17-34.

- Shibutani, T. (1955). Reference groups as perspectives. *The American Journal of Sociology*, 60(6), 562-569.
- Tallman, S., Jenkins, M., Henry, N. & Pinch, S. (2004). Knowledge, clusters, and competitive advantage. *Academy of Management Review*, 29(2), 258-271.
- Tallman, S. & Phene, A. 2007. Leveraging knowledge across geographical boundaries. *Organization Science*, 18(2), 252-260.
- Thrift, N. & Olds, K. (1996). Refiguring the economic in economic geography. *Progress in Human Geography*, 20, 311-337.
- Uzzi, B. (1996). The sources and consequences of embeddedness for the economic performance of organizations: The network effect. *American Sociological Review*, 61, 674-698.
- Uzzi, B. (1997). Social structure and competition in interfirm networks: The paradox of embeddedness. *Administrative Science Quarterly*, 42(1), 35-67.
- Weick, K.E. (1995). *Sensemaking in organizations*. California: Sage.
- Wenger, E. (1998). *Communities of practice. Learning, meaning, and identity*. New York: Cambridge University Press.
- Zaheer, A. & Bell, G.G. (2005). Benefiting from network position: firm capabilities, structural holes, and performance. *Strategic Management Journal*, 26: 809-825.

<i>Variable</i>	<i>Survey item</i>
Name generator questions (based on Perry-Smith 2006)	<p>NG1: Thinking back over the past two years, with whom do you frequently communicate about business or work-related matters? This can involve subject matters with respect to your daily work, practical problems, new (technological) developments in your line of business, market developments, et cetera.</p> <p>NG2: Add to this list persons who often provide you with new insights related to business or work-related matters.</p> <p>NG3: Add to this list persons who provide you with new insights with respect to business or work-related matters, even those you interact with less frequently, more informally, or less intensively.</p> <p>NG4: Add to this list persons with whom you communicate about business or work-related matters, but are not located in Amsterdam or the Netherlands (if applicable).</p>
Geographical proximity	Specify for each person his or her geographical business location.
Relational proximity (Granovetter 1973; Burt 1997; Perry-Smith 2006)	<p>How frequently do you communicate with each person on average? <i>Daily Weekly Monthly Less than once a month</i></p> <p>How close are you with each person? <i>Especially Close Close Less Close Distant</i></p>
Cognitive proximity (based on Rodan & Galunic 2004)	<p>The next question deals with the degree to which your work-related knowledge is similar or different with each of your contacts.</p> <p>Choose very similar if your work-related knowledge closely matches that of the person you are considering, like for example in the case of a football player and the football-team coach. Choose very different if your work-related knowledge hardly matches that of the person you are considering, like for example in the case of an airplane pilot and a bicycle repairman.</p> <p><i>Very similar Similar Different Very different Don't know</i></p>
Epistemic proximity	<p>The IT and Internet industry is characterized by debates dealing with 'Web 2.0-era', Open-source, Open ID, social communities (e.g. Hyves, LinkedIn, Twitter), et cetera. Indicate for each of your contacts to what degree their position towards these topics is similar or different from yours.</p> <p>Choose very similar if you think your view of Web 2.0 and related topics closely matches that of the person you are considering. This would be the case if you and the person you are considering both value such new developments in your discipline similarly. Choose very different if you and the person you are considering frequently disagree on the value and use of such new developments.</p> <p><i>Very similar Similar Different Very different Don't know</i></p>

Table continues on next page >

Table 1: Questionnaire outline

Information/ knowledge seeking (based on Borgatti & Cross, 2003)	<p>Please indicate how often you have turned to this person for information or knowledge on business or work-related topics in the past year? (GetInfo) <i>Very frequently Frequently Sometimes Hardly ever</i></p> <p>Please indicate how often this person has turned to you for information or knowledge on business or work-related topics in the past year? (GiveInfo) <i>Very frequently Frequently Sometimes Hardly ever</i></p>
Significance of information interaction	<p>People can be of great value to you as entrepreneur, for instance by providing new business or work-related ideas and knowledge. Indicate for each person how valuable this person has been to you in providing you with new ideas and knowledge.</p> <p>Choose very much if you feel that the person you are considering, wittingly or unwittingly, has been of great value to you from an entrepreneurial perspective. Choose very little if you feel that the person you are considering has been of little value to you from an entrepreneurial perspective. <i>Very much Much Average Little Very little</i></p>
Ease of knowledge transfer (based on Reagans & McEvily, 2003)	<p>Indicate for each person how easy it is for you to explain to him/her a key concept, idea, or theory from your discipline.</p> <p>Choose very easy if you consider it to be little effort to explain to this person a key concept, theory, or idea from your discipline. Choose very hard if you consider it to be much effort to explain to this person a key concept, theory, or idea from your discipline. <i>Very easy Easy Hard Very hard</i></p>

Table 1: Questionnaire outline (continued)

Sex	Years in business with present company					Entrepreneurial experience (years)					Number of employees				
M F	<-1	1-4	5-8	9-12	13+	<-2	3-5	6-10	11+		0	1-5	6-10	11-15	16-21
47 3	0	26	16	5	3	7	14	20	9		6	17	10	10	7

Table 2: Descriptive information ego-respondents

Indicators of model fit	Formal requirements $N > 250$, $m < 12^*$ (Hair et al., 2006)	Model fit
CFI	.95 or better	.996
TLI	.95 or better	.99
RMSEA	Values < .07 with CFI of .97 or higher	.0223
CMIN/DF	Values < 2 (conservative estimate)	1.225
Significance X^2	Insignificant p -values can result with good fit	.2793

Table 3: Measures of model fit

* m = number of observed variables, N = number of observations per group

Hypothesis	Test	Support
<i>Proposition R1: higher relational proximity between ego and alter increases the amount of interactive learning taking place in that relationship.</i>	SEM	Full
<i>Proposition R2: higher relational proximity between ego and alter increases the ease with which knowledge is being transferred between ego and alter.</i>	SEM	No
<i>Proposition C1: the amount of interactive learning taking place in a given ego-alter relationship has an inverted U-shaped relation with the level of cognitive proximity between ego and alter.</i>	SEM	No, linear relation instead
<i>Proposition C2: higher cognitive proximity between ego and alter increases the ease with which knowledge is being transferred between ego and alter.</i>	SEM	Full
<i>Proposition E1: the level of epistemic proximity between ego and alter is directly and positively related to the amount of interactive learning taking place in a given ego-alter relationship.</i>	SEM	No
<i>Proposition E2: higher epistemic proximity between ego and alter increases the ease with which knowledge is being transferred between ego and alter.</i>	SEM	Full
<i>Proposition G1: the degree of geographical proximity in a given ego-alter relationship is indirectly related to the amount of interactive learning and ease of knowledge transfer characterizing that relationship, by positively strengthening the other proximity dimensions of that relationship.</i>	SEM	Partial, only relational proximity

Table 4: Overview of hypotheses, tests, and results

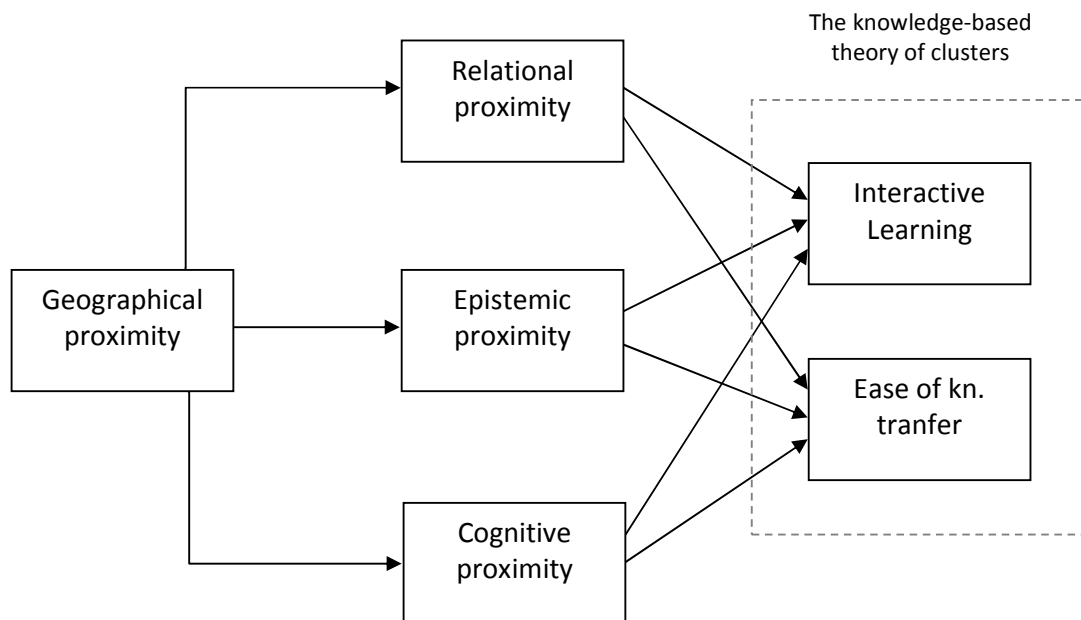
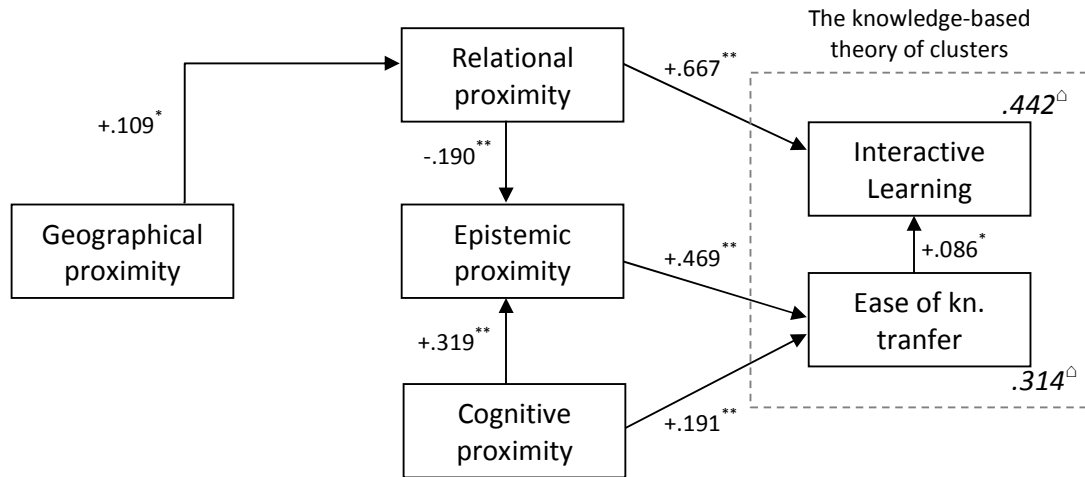


Figure 1: Conceptual model



MEASURES of FIT | CFI: 0.996 | TLI rho2: 0.990 | CMIN/DF: 1.225 | RMSEA: 0.023

X²: 9.8 | df: 8

* p < 0.05 | ** p < 0.01

△ = explained variance

Figure 2: Empirical model

2006-1	Tibert Verhagen Selmar Meents Yao-Hua Tan	Perceived risk and trust associated with purchasing at Electronic Marketplaces, 39 p.
2006-2	Mediha Sahin Marius Rietdijk Peter Nijkamp	Ethnic employees' behaviour vis-à-vis customers in the service sector, 17 p.
2006-3	Albert J. Menkveld	Splitting orders in overlapping markets: A study of cross-listed stocks, 45 p.
2006-4	Kalok Chan Albert J. Menkveld Zhishu Yang	Are domestic investors better informed than foreign investors? Evidence from the perfectly segmented market in China, 33 p.
2006-5	Kalok Chan Albert J. Menkveld Zhishu Yang	Information asymmetry and asset prices: Evidence from the China foreign share discount, 38 p.
2006-6	Albert J. Menkveld Yiu C. Cheung Frank de Jong	Euro-area sovereign yield dynamics: The role of order imbalance, 34 p.
2006-7	Frank A.G. den Butter	The industrial organisation of economic policy preparation in the Netherlands
2006-8	Evgenia Motchenkova	Cost minimizing sequential punishment policies for repeat offenders, 20 p.
2006-9	Ginés Hernández- Cánovas Johanna Koëter- Kant	SME Financing in Europe: Cross-country determinants of debt maturity, 30 p.
2006-10	Pieter W. Jansen	Did capital market convergence lower the effectiveness of the interest rate as a monetary policy tool? 17 p.
2006-11	Pieter W. Jansen	Low inflation, a high net savings surplus and institutional restrictions keep the long-term interest rate low. 24 p.
2006-12	Joost Baeten Frank A.G. den Butter	Welfare gains by reducing transactions costs: Linking trade and innovation policy, 28 p.
2006-13	Frank A.G. den Butter Paul Wit	Trade and product innovations as sources for productivity increases: an empirical analysis, 21 p.
2006-14	M. Francesca Cracolici Miranda Cuffaro Peter Nijkamp	Sustainable tourist development in Italian Holiday destination, 10 p.

2006-15	Simonetta Longhi Peter Nijkamp	Forecasting regional labor market developments under spatial heterogeneity and spatial correlation, 25 p
2006-16	Mediha Sahin Peter Nijkamp Tüzin Baycan-Levent	Migrant Entrepreneurship from the perspective of cultural diversity, 21 p.
2006-17	W.J. Wouter Botzen Philip S. Marey	Does the ECB respond to the stock market? 23 p.
2006-18	Tüzin Baycan-Levent Peter Nijkamp	Migrant female entrepreneurship: Driving forces, motivation and performance, 31 p.
2006-19	Ginés Hernández-Cánovas Johanna Koëter-Kant	The European institutional environment and SME relationship lending: Should we care? 24 p.
2006-20	Miranda Cuffaro Maria Francesca Cracolici Peter Nijkamp	Economic convergence versus socio-economic convergence in space, 13 p.
2006-21	Mediha Sahin Peter Nijkamp Tüzin Baycan-Levent	Multicultural diversity and migrant entrepreneurship: The case of the Netherlands, 29 p.

2007-1	M. Francesca Cracolici Miranda Cuffaro Peter Nijkamp	Geographical distribution of enemployment: An analysis of provincial differences in Italy, 21 p.
2007-2	Daniel Leliefeld Evgenia Motchenkova	To protect in order to serve, adverse effects of leniency programs in view of industry asymmetry, 29 p.
2007-3	M.C. Wassenaar E. Dijkgraaf R.H.J.M. Gradus	Contracting out: Dutch municipalities reject the solution for the VAT-distortion, 24 p.
2007-4	R.S. Halbersma M.C. Mikkers E. Motchenkova I. Seinen	Market structure and hospital-insurer bargaining in the Netherlands, 20 p.
2007-5	Bas P. Singer Bart A.G. Bossink Herman J.M. Vande Putte	Corporate Real estate and competitive strategy, 27 p.
2007-6	Dorien Kooij Annet de Lange Paul Jansen Josje Dijkers	Older workers' motivation to continue to work: Five meanings of age. A conceptual review, 46 p.
2007-7	Stella Flytzani Peter Nijkamp	Locus of control and cross-cultural adjustment of expatriate managers, 16 p.
2007-8	Tibert Verhagen Willemijn van Dolen	Explaining online purchase intentions: A multi-channel store image perspective, 28 p.
2007-9	Patrizia Riganti Peter Nijkamp	Congestion in popular tourist areas: A multi-attribute experimental choice analysis of willingness-to-wait in Amsterdam, 21 p.
2007-10	Tüzin Baycan-Levent Peter Nijkamp	Critical success factors in planning and management of urban green spaces in Europe, 14 p.
2007-11	Tüzin Baycan-Levent Peter Nijkamp	Migrant entrepreneurship in a diverse Europe: In search of sustainable development, 18 p.
2007-12	Tüzin Baycan-Levent Peter Nijkamp Mediha Sahin	New orientations in ethnic entrepreneurship: Motivation, goals and strategies in new generation ethnic entrepreneurs, 22 p.
2007-13	Miranda Cuffaro Maria Francesca Cracolici Peter Nijkamp	Measuring the performance of Italian regions on social and economic dimensions, 20 p.

2007-14	Tüzin Baycan-Levent Peter Nijkamp	Characteristics of migrant entrepreneurship in Europe, 14 p.
2007-15	Maria Teresa Borzacchiello Peter Nijkamp Eric Koomen	Accessibility and urban development: A grid-based comparative statistical analysis of Dutch cities, 22 p.
2007-16	Tibert Verhagen Selmar Meents	A framework for developing semantic differentials in IS research: Assessing the meaning of electronic marketplace quality (EMQ), 64 p.
2007-17	Aliye Ahu Gülümser Tüzin Baycan Levent Peter Nijkamp	Changing trends in rural self-employment in Europe, 34 p.
2007-18	Laura de Dominicis Raymond J.G.M. Florax Henri L.F. de Groot	De ruimtelijke verdeling van economische activiteit: Agglomeratie- en locatiepatronen in Nederland, 35 p.
2007-19	E. Dijkgraaf R.H.J.M. Gradus	How to get increasing competition in the Dutch refuse collection market? 15 p.

2008-1	Maria T. Borzacchiello Irene Casas Biagio Ciuffo Peter Nijkamp	Geo-ICT in Transportation Science, 25 p.
2008-2	Maura Soekijad Jeroen Walschots Marleen Huysman	Congestion at the floating road? Negotiation in networked innovation, 38 p.
2008-3	Marlous Agterberg Bart van den Hooff Marleen Huysman Maura Soekijad	Keeping the wheels turning: Multi-level dynamics in organizing networks of practice, 47 p.
2008-4	Marlous Agterberg Marleen Huysman Bart van den Hooff	Leadership in online knowledge networks: Challenges and coping strategies in a network of practice, 36 p.
2008-5	Bernd Heidergott Haralambie Leahu	Differentiability of product measures, 35 p.
2008-6	Tibert Verhagen Frans Feldberg Bart van den Hooff Selmar Meents	Explaining user adoption of virtual worlds: towards a multipurpose motivational model, 37 p.
2008-7	Masagus M. Ridhwan Peter Nijkamp Piet Rietveld Henri L.F. de Groot	Regional development and monetary policy. A review of the role of monetary unions, capital mobility and locational effects, 27 p.
2008-8	Selmar Meents Tibert Verhagen	Investigating the impact of C2C electronic marketplace quality on trust, 69 p.
2008-9	Junbo Yu Peter Nijkamp	China's prospects as an innovative country: An industrial economics perspective, 27 p
2008-10	Junbo Yu Peter Nijkamp	Ownership, r&d and productivity change: Assessing the catch-up in China's high-tech industries, 31 p
2008-11	Elbert Dijkgraaf Raymond Gradus	Environmental activism and dynamics of unit-based pricing systems, 18 p.
2008-12	Mark J. Koetse Jan Rouwendal	Transport and welfare consequences of infrastructure investment: A case study for the Betuweroute, 24 p
2008-13	Marc D. Bahlmann Marleen H. Huysman Tom Elfring Peter Groenewegen	Clusters as vehicles for entrepreneurial innovation and new idea generation – a critical assessment
2008-14	Soushi Suzuki Peter Nijkamp	A generalized goals-achievement model in data envelopment analysis: An application to efficiency improvement in local government finance in Japan, 24 p.
2008-15	Tüzin Baycan-Levent	External orientation of second generation migrant entrepreneurs. A sectoral

	Peter Nijkamp Mediha Sahin	study on Amsterdam, 33 p.
2008-16	Enno Masurel	Local shopkeepers' associations and ethnic minority entrepreneurs, 21 p.
2008-17	Frank Frößler Boriana Rukanova Stefan Klein Allen Higgins Yao-Hua Tan	Inter-organisational network formation and sense-making: Initiation and management of a living lab, 25 p.
2008-18	Peter Nijkamp Frank Zwetsloot Sander van der Wal	A meta-multicriteria analysis of innovation and growth potentials of European regions, 20 p.
2008-19	Junbo Yu Roger R. Stough Peter Nijkamp	Governing technological entrepreneurship in China and the West, 21 p.
2008-20	Maria T. Borzacchiello Peter Nijkamp Henk J. Scholten	A logistic regression model for explaining urban development on the basis of accessibility: a case study of Naples, 13 p.
2008-21	Marius Ooms	Trends in applied econometrics software development 1985-2008, an analysis of Journal of Applied Econometrics research articles, software reviews, data and code, 30 p.
2008-22	Aliye Ahu Gülümser Tüzin Baycan-Levent Peter Nijkamp	Changing trends in rural self-employment in Europe and Turkey, 20 p.
2008-23	Patricia van Hemert Peter Nijkamp	Thematic research prioritization in the EU and the Netherlands: an assessment on the basis of content analysis, 30 p.
2008-24	Jasper Dekkers Eric Koomen	Valuation of open space. Hedonic house price analysis in the Dutch Randstad region, 19 p.

2009-1	Boriana Rukanova Rolf T. Wignand Yao-Hua Tan	From national to supranational government inter-organizational systems: An extended typology, 33 p.
2009-2	Marc D. Bahlmann Marleen H. Huysman Tom Elfring Peter Groenewegen	Global Pipelines or global buzz? A micro-level approach towards the knowledge-based view of clusters, 33 p.
2009-3	Julie E. Ferguson Marleen H. Huysman	Between ambition and approach: Towards sustainable knowledge management in development organizations, 33 p.
2009-4	Mark G. Leijssen	Why empirical cost functions get scale economies wrong, 11 p.
2009-5	Peter Nijkamp Galit Cohen-Blankshtain	The importance of ICT for cities: e-governance and cyber perceptions, 14 p.
2009-6	Eric de Noronha Vaz Mário Caetano Peter Nijkamp	Trapped between antiquity and urbanism. A multi-criteria assessment model of the greater Cairo metropolitan area, 22 p.
2009-7	Eric de Noronha Vaz Teresa de Noronha Vaz Peter Nijkamp	Spatial analysis for policy evaluation of the rural world: Portuguese agriculture in the last decade, 16 p.
2009-8	Teresa de Noronha Vaz Peter Nijkamp	Multitasking in the rural world: Technological change and sustainability, 20 p.
2009-9	Maria Teresa Borzacchiello Vincenzo Torrieri Peter Nijkamp	An operational information systems architecture for assessing sustainable transportation planning: Principles and design, 17 p.
2009-10	Vincenzo Del Giudice Pierfrancesco De Paola Francesca Torrieri Francesca Pagliari Peter Nijkamp	A decision support system for real estate investment choice, 16 p.
2009-11	Miruna Mazurencu Marinescu Peter Nijkamp	IT companies in rough seas: Predictive factors for bankruptcy risk in Romania, 13 p.
2009-12	Boriana Rukanova Helle Zinner Hendriksen Eveline van Stijn Yao-Hua Tan	Bringing is innovation in a highly-regulated environment: A collective action perspective, 33 p.
2009-13	Patricia van Hemert Peter Nijkamp Jolanda Verbraak	Evaluating social science and humanities knowledge production: an exploratory analysis of dynamics in science systems, 20 p.

2009-14	Roberto Patuelli Aura Reggiani Peter Nijkamp Norbert Schanne	Neural networks for cross-sectional employment forecasts: A comparison of model specifications for Germany, 15 p.
2009-15	André de Waal Karima Kourtit Peter Nijkamp	The relationship between the level of completeness of a strategic performance management system and perceived advantages and disadvantages, 19 p.
2009-16	Vincenzo Punzo Vincenzo Torrieri Maria Teresa Borzacchiello Biagio Ciuffo Peter Nijkamp	Modelling intermodal re-balance and integration: planning a sub-lagoon tube for Venezia, 24 p.
2009-17	Peter Nijkamp Roger Stough Mediha Sahin	Impact of social and human capital on business performance of migrant entrepreneurs – a comparative Dutch-US study, 31 p.
2009-18	Dres Creal	A survey of sequential Monte Carlo methods for economics and finance, 54 p.
2009-19	Karima Kourtit André de Waal	Strategic performance management in practice: Advantages, disadvantages and reasons for use, 15 p.
2009-20	Karima Kourtit André de Waal Peter Nijkamp	Strategic performance management and creative industry, 17 p.
2009-21	Eric de Noronha Vaz Peter Nijkamp	Historico-cultural sustainability and urban dynamics – a geo-information science approach to the Algarve area, 25 p.
2009-22	Roberta Capello Peter Nijkamp	Regional growth and development theories revisited, 19 p.
2009-23	M. Francesca Cracolici Miranda Cuffaro Peter Nijkamp	Tourism sustainability and economic efficiency – a statistical analysis of Italian provinces, 14 p.
2009-24	Caroline A. Rodenburg Peter Nijkamp Henri L.F. de Groot Erik T. Verhoef	Valuation of multifunctional land use by commercial investors: A case study on the Amsterdam Zuidas mega-project, 21 p.
2009-25	Katrin Oltmer Peter Nijkamp Raymond Florax Floor Brouwer	Sustainability and agri-environmental policy in the European Union: A meta-analytic investigation, 26 p.
2009-26	Francesca Torrieri Peter Nijkamp	Scenario analysis in spatial impact assessment: A methodological approach, 20 p.
2009-27	Aliye Ahu Gülümser Tüzin Baycan-Levent Peter Nijkamp	Beauty is in the eyes of the beholder: A logistic regression analysis of sustainability and locality as competitive vehicles for human settlements, 14 p.

2009-28	Marco Percoco Peter Nijkamp	Individual time preferences and social discounting in environmental projects, 24 p.
2009-29	Peter Nijkamp Maria Abreu	Regional development theory, 12 p.
2009-30	Tüzin Baycan-Levent Peter Nijkamp	7 FAQs in urban planning, 22 p.
2009-31	Aliye Ahu Gülümser Tüzin Baycan-Levent Peter Nijkamp	Turkey's rurality: A comparative analysis at the EU level, 22 p.
2009-32	Frank Bruinsma Karima Kourtit Peter Nijkamp	An agent-based decision support model for the development of e-services in the tourist sector, 21 p.
2009-33	Mediha Sahin Peter Nijkamp Marius Rietdijk	Cultural diversity and urban innovativeness: Personal and business characteristics of urban migrant entrepreneurs, 27 p.
2009-34	Peter Nijkamp Mediha Sahin	Performance indicators of urban migrant entrepreneurship in the Netherlands, 28 p.
2009-35	Manfred M. Fischer Peter Nijkamp	Entrepreneurship and regional development, 23 p.
2009-36	Faroek Lazrak Peter Nijkamp Piet Rietveld Jan Rouwendal	Cultural heritage and creative cities: An economic evaluation perspective, 20 p.
2009-37	Enno Masurel Peter Nijkamp	Bridging the gap between institutions of higher education and small and medium-size enterprises, 32 p.
2009-38	Francesca Medda Peter Nijkamp Piet Rietveld	Dynamic effects of external and private transport costs on urban shape: A morphogenetic perspective, 17 p.
2009-39	Roberta Capello Peter Nijkamp	Urban economics at a cross-yard: Recent theoretical and methodological directions and future challenges, 16 p.
2009-40	Enno Masurel Peter Nijkamp	The low participation of urban migrant entrepreneurs: Reasons and perceptions of weak institutional embeddedness, 23 p.
2009-41	Patricia van Hemert Peter Nijkamp	Knowledge investments, business R&D and innovativeness of countries. A qualitative meta-analytic comparison, 25 p.
2009-42	Teresa de Noronha Vaz Peter Nijkamp	Knowledge and innovation: The strings between global and local dimensions of sustainable growth, 16 p.
2009-43	Chiara M. Traversi Peter Nijkamp	Managing environmental risk in agriculture: A systematic perspective on the potential of quantitative policy-oriented risk valuation, 19 p.
2009-44	Sander de Leeuw	Logistics aspects of emergency preparedness in flood disaster prevention, 24 p.

Iris F.A. Vis
Sebastiaan B. Jonkman

2009-45	Eveline S. van Leeuwen Peter Nijkamp	Social accounting matrices. The development and application of SAMs at the local level, 26 p.
2009-46	Tibert Verhagen Willemijn van Dolen	The influence of online store characteristics on consumer impulsive decision-making: A model and empirical application, 33 p.
2009-47	Eveline van Leeuwen Peter Nijkamp	A micro-simulation model for e-services in cultural heritage tourism, 23 p.
2009-48	Andrea Caragliu Chiara Del Bo Peter Nijkamp	Smart cities in Europe, 15 p.
2009-49	Farook Lazrak Peter Nijkamp Piet Rietveld Jan Rouwendal	Cultural heritage: Hedonic prices for non-market values, 11 p.
2009-50	Eric de Noronha Vaz João Pedro Bernardes Peter Nijkamp	Past landscapes for the reconstruction of Roman land use: Eco-history tourism in the Algarve, 23 p.
2009-51	Eveline van Leeuwen Peter Nijkamp Teresa de Noronha Vaz	The Multi-functional use of urban green space, 12 p.
2009-52	Peter Bakker Carl Koopmans Peter Nijkamp	Appraisal of integrated transport policies, 20 p.
2009-53	Luca De Angelis Leonard J. Paas	The dynamics analysis and prediction of stock markets through the latent Markov model, 29 p.
2009-54	Jan Anne Annema Carl Koopmans	Een lastige praktijk: Ervaringen met waarderen van omgevingskwaliteit in de kosten-batenanalyse, 17 p.
2009-55	Bas Straathof Gert-Jan Linders	Europe's internal market at fifty: Over the hill? 39 p.
2009-56	Joaquim A.S. Gromicho Jelke J. van Hoorn Francisco Saldanha-da-Gama Gerrit T. Timmer	Exponentially better than brute force: solving the job-shop scheduling problem optimally by dynamic programming, 14 p.
2009-57	Carmen Lee Roman Kraeussl Leo Paas	The effect of anticipated and experienced regret and pride on investors' future selling decisions, 31 p.
2009-58	René Sitters	Efficient algorithms for average completion time scheduling, 17 p.

2009-59

Masood Gheasi
Peter Nijkamp
Piet Rietveld

Migration and tourist flows, 20 p.

2010-1	Roberto Patuelli Norbert Schanne Daniel A. Griffith Peter Nijkamp	Persistent disparities in regional unemployment: Application of a spatial filtering approach to local labour markets in Germany, 28 p.
2010-2	Thomas de Graaff Ghebre Debrezion Piet Rietveld	Schaalsprong Almere. Het effect van bereikbaarheidsverbeteringen op de huizenprijzen in Almere, 22 p.
2010-3	John Steenbruggen Maria Teresa Borzacchiello Peter Nijkamp Henk Scholten	Real-time data from mobile phone networks for urban incidence and traffic management – a review of application and opportunities, 23 p.
2010-4	Marc D. Bahlmann Tom Elfring Peter Groenewegen Marleen H. Huysman	Does distance matter? An ego-network approach towards the knowledge-based theory of clusters, 31 p.

